SPATIAL AND SEASONAL VARIATIONS OF METAL CONCENTRATIONS IN SEDIMENTS FROM THE SCHELDT ESTUARY

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Estuaries concentrate pollutants carried along by rivers from the whole drainage basin into a relatively compact system that can be monitored more easily. They offer a last opportunity to control outputs to the marine environment where substances become diffuse and difficult to manage. Therefore, estuaries are crucial links in water quality management (Van Damme *et al.*, 2005). The Scheldt Estuary used to be heavily contaminated by metals. Current metal concentrations in the estuary have decreased, but historical contamination is still traceable in deposited sediments (Baeyens *et al.*, 2005). Metals in aquatic environments can occur in a dissolved or particle-bound form. Both dissolved metals and metals bound to suspended solids in the water column can be transported towards the sea.

The distribution of metals (As, Cd, Cr, Cu, Mn, Ni, Pb and Zn) in subtidal and intertidal sediments of the Scheldt Estuary is studied in field sampling campaigns. Subtidal samples are collected along the whole estuary, from Ghent to the mouth. Intertidal sediments are studied on a freshwater tidal flat and tidal marsh at about 103km distance from the river mouth. Both subtidal and intertidal samples show correlations between metal contents and sediment characteristics: metal concentrations correlate positively with the organic content of the sediment and negatively with its median grain size. Subtidal sediment metal concentrations in the estuary decrease towards the river mouth. This can be explained by (1) tidal mixing with less polluted suspended particles originating from the marine environment, (2) the degradation of organic particles and (3) the increase of dissolved oxygen and salinity, causing metal mobilization.

Sediments on a freshwater tidal marsh contain higher metal concentrations than subtidal sediments at the same location. This difference is due to the smaller grain size and the larger organic content of the intertidal sediments. Seasonal variations in intertidal sediment metal concentrations result in lower concentrations during winter because of the larger median grain size which is caused by a higher river discharge. Deposition of suspended solids on tidal marshes causes retention of particle-bound metals in the estuary.

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References

Baeyens W., M. Leermaekers, M. De Gieter, H.L. Nguyen, K. Parmentier, S. Panutrakul and M. Elskens. 2005. Overview of trace metal contamination in the Scheldt Estuary and effect of regulatory measures. Hydrobiologia 540:141-154.

Van Damme S., E. Struyf, T. Maris, T. Ysebaert, F. Dehairs., M. Tackx, C. Heip and P. Meire. 2005. Spatial and temporal patterns of water quality along the estuarine salinity gradient of the Scheldt Estuary (Belgium and the Netherlands): results of an integrated monitoring approach. Hydrobiologia 540:29-45.